

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of	)	Group Art Unit: 1793
Raimo Leimala	)	Examiner: Jie Yang
Application No.: 10/511,290	)	Confirmation No.: 1867
Filed: October 14, 2004	)	Appeal No.: _____
For: METHOD FOR THE PURIFICATION	)	
OF COPPER CHLORIDE	)	
SOLUTION	)	
	)	

**REPLY BRIEF**

Commissioner for Patents  
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Sir:

Appellants respectfully submit herewith a Reply Brief in accordance with 37 C.F.R. § 41.41, directed to new points of argument raised in the Examiner's Answer dated November 12, 2010.

The Examiner's Answer attempts to address a number of arguments raised in Appellant's Brief. Because the Office failed to adequately consider or address these arguments prior to closing of prosecution, the Office necessarily raises new arguments in the Examiner's Answer.

The Examiner's Answer attempts to address Appellant's argument that the Office has failed to explain which metal impurities are being removed in the process of Hyvärinen et al. that it believes would also be removed by Cupertino et al.

The Office responds to this argument by asserting,

Regarding the argument 1), the Examiner disagrees with the appellant's argument because as pointed out in the rejections for the instant claims. US'600 teaches that impurities of the CuCl-NaCl solution are removed by using known reagents (Col.3, lines 59-63 of US'600). The whole paragraph for this teaching is: "Thereafter the solution 9 obtained from reduction, in which solution all copper now is present as monovalent, is conducted to solution purification 10, where impurities of the CuCl--NaCl solution are removed by using known reagents 11, and also by means of products obtained from the later stages of the process, i.e. granular copper 8 and sodium hydroxide 13 formed in the chlorine-alkali electrolysis 12. In the solution purification, metallic impurities are precipitated from the copper (I) chloride solution as precipitates 14 at pH values which are lower than the pH values of a solution corresponding to the precipitation of Cu<sub>2</sub>O." (Col.3, line 59-col.4, line 2 of US'600). In here, US'600 clearly teaches metallic impurities are precipitated from the copper (I) chloride solution as precipitates.

Examiner's Answer at pages 11-12. The Office's quotation of the cited reference merely highlights Appellant's point. The specific metallic impurities are not mentioned in Hyvärinen et al. If they are not mentioned, then some explanation of how the Office (or one having ordinary skill in the art) can possibly know that the

material of Cupertino et al. can remove them is definitely in order. This is particularly true since the Office appears to take the position, without any support, that the material of Cupertino et al. is capable of selective removal of metals. If the material of Cupertino et al. is selective, then it seems reasonable to require that the Office explain how it knows that the metals that will be selectively removed are present in Hyvärinen et al. The Office's circular statements quoted above completely fail to answer this question.

Moreover, the Office's comments quoted above refer to the disclosure in Hyvärinen et al. relating to the use of granular copper and sodium hydroxide to precipitate metallic impurities at certain pH values. Granular copper can be used for cementation of silver and sodium hydroxide can be used for precipitation of other (metal) impurities, and such precipitation is recited in the claimed invention for the rough removal of metal impurities (claim 12). However, Hyvärinen et al. provides only a general description of such a process, does not go into detail regarding solution purification, and does not by any means refer to ion-exchange. The conventional way to remove impurities from a chloride solution is by precipitation, whether hydroxide precipitation or carbonate precipitation is used. The carbonate method is used for example in US 5,487,819 (col. 12, lines 28- 45, Example 6). This document shows also that the "acidic conditions" used in such a precipitation step are very mildly acidic conditions where the pH is near 6. However, this document gives no hint or suggestion of using ion-exchange for the final purification as recited in Appellant's claims.

As indicated above, the pH values used with the hydroxide or carbonate-type precipitation techniques of Hyvärinen et al. are slightly acidic. By contrast, Cupertino

et al. removes metals (by using a liquid-liquid extraction) in the form of sulfates because the solution contains sulfuric acid. The pH of such a solution is so much more acidic than that of Hyvärinen et al. that one of ordinary skill in this art would have no reasonable expectation that the liquid-liquid extraction or ion exchange resin of Cupertino et al. could be applied to a solution of the pH level in Hyvärinen et al. In this regard, Appellant notes that the solution to be purified in Cupertino et al. contains about 170 g/l sulfuric acid (which would produce a pH that is negative, as indicated in the attached pH calculation).

The only example of Cupertino et al. that even arguably relates to the use of an ion exchange resin is Example 5, where antimony and bismuth sulfates are removed. Example 6 of Cupertino et al. describes stripping of the loaded ion exchange resin or organic extraction solution, not removal of the metals from a target stream. The stripping of the loaded resin is carried out using a chloride solution; however this has nothing to do with the ion exchange step itself, which in Cupertino et al. occurs in a highly acidic sulfate system. Appellant submits that one of ordinary skill in the art would have a disincentive to combine Cupertino et al. with Hyvärinen et al. based upon the pH disparity noted above. Moreover, the only example in Cupertino et al. using an ion exchange resin does so not only in a highly acidic environment, which is outside the scope of the claim language "having an acidic or neutral pH of at least 6." Thus, even if the reference teachings were properly combinable, one of ordinary skill would be taught by Cupertino et al. to use a considerably lower pH than Appellant's claim.

The Office's combination of reference teachings is particularly problematic with regard to claim 5, which recites metal impurities that are not disclosed in the

only example of Cupertino et al. that actually uses an ion exchange resin. Because the aqueous solution purified in Cupertino et al. is a highly acidic sulfuric acid solution having a negative pH, and which is only shown to remove antimony and bismuth using an ion exchange resin, Appellant submits that this disclosure does not suggest using an ion exchange resin to remove metal impurities from a slightly acidic or neutral chloride solution, especially those metal impurities recited in claim 5.

This failure of Cupertino et al. is hardly surprising when the problem and solution of Cupertino et al. is compared to that of Appellant's invention. To the extent that Cupertino et al. is concerned with a weakly acidic solution, it is solving the problem of stripping metal from an organic complex thereof, i.e., from the extraction liquid or ion exchange resin, so that this liquid or resin can be recycled to the extraction process. By contrast, Appellant is concerned with using an ion exchange resin to selectively remove metal contaminants while leaving monovalent copper in solution. The Office asserts:

The Appellant argued that no disclosure of any monovalent copper in US'118 to be precipitated out, the Appellant's argument is against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.

Examiner's Answer, page 12. However, as Appellant has explained above (a) one or ordinary skill would not have combined Hyvärinen et al. with any reasonable expectation of success, and (b) even if the references were combined, the resulting low pH extraction would not fall within Appellant's claims. Moreover, that Appellant has pointed out how the portion of Cupertino et al. cited by the Examiner has nothing to do with Appellant's invention (or with the process of Hyvärinen et al.) does not, in

Appellant's view, constitute "arguing the reference separately."

With respect to the other arguments raised by Appellant (that the Office has not explained why one of ordinary skill would look to Cupertino et al. if metallic impurities have already been adequately removed by Hyvärinen et al., that the Office has not identified any particular impurity that would remain after the Hyvärinen et al. treatment; that the Office has not explained where either reference teaches that the organic complexes of Cupertino et al. are a suitable replacement for, or addition to the Hyvärinen et al. techniques, and that the Office has not explained why one of ordinary skill would select the ion exchange resin of Cupertino et al. instead of the liquid extractant disclosed and emphasized therein), the Office does not appear to have addressed these arguments in any meaningful way, despite acknowledging them at page 10 of the Examiner's Answer.

In this regard, the Office makes reference to Partridge in the portion of the Examiner's Answer bridging paragraphs 12 and 13. However, this portion of the Examiner's Answer appears to be directed to addressing Appellant's arguments concerning the rejection over Hyvärinen et al. in view of Cupertino et al. (i.e., the Office's "argument 1" at pages 10-11 of the Examiner's Answer). Partridge was not relied upon in this rejection. Appellants submit that the Office's arguments are irrelevant to the rejection actually made, and that the Office should not be permitted to make "stealth" new grounds of rejection at this late stage.

The Office asserts that

Still regarding the argument 1), using the proper reagents to remove the impurities obvious to one of ordinary skilled in the art, which is evidenced by US'600. US'600 teaches "... impurities of the CuCl--NaCl solution are removed by using known reagents 11..." (Col.3, line 59-col.4, line 2 of US'600).

Examiner's Answer, pages 12-13. However, the portion of Cupertino et al. that is referenced also includes copper. As Appellant has previously explained, the entire point of Appellant's invention is to remove metallic impurities while leaving monovalent copper behind. If the sorbents and extractants of Cupertino et al. remove copper, as Cupertino et al. states, then even if Cupertino et al. could be combined with Hyvärinen et al., the result would not be expected to be a process that selectively removed metallic impurities and left behind monovalent copper. Moreover, the portion of Cupertino et al. cited by the Office makes clear that the metals to be removed by the sorbent or extractant should form complexes with chloride ion, so that they can be recovered and the sorbent or extractant reused. However, if the metals have an affinity for chloride ion over the sorbent/extractant, then it is reasonable for the Office to be required to explain why one of ordinary skill in the art would apply that sorbent/extractant in an attempt to remove the metals from a chloride milieu (i.e., a solution obtained in a chloride-based recovery process). Simple logic dictates that a worker with ordinary skill in this art would expect these metals to remain in the chloride solution in the first place, since Cupertino et al. teaches using a chloride solution to remove them from the sorbent/extractant. The Office has failed to supply any such explanation.

The Office further argues:

US`118 also teaches an acid strength of up to 0.5 molar above the stoichiometric requirement for stripping the metal the metal whereby said complex is decomposed and metal ions are transferred to the aqueous solution (Claim 1 of US`118, 0.5 molar copper is about 32g/l— noted by examiner), which is within the 30-100g/l monovalent copper content range as recited in the instant claim 15. The example applying chelating

resin may refer to the example 5 of US'118.

Examiner's Answer, page 13. Again, the Office appears to have focused on the process of Cupertino et al. for stripping the metal impurity from the sorbent or extractant. This has nothing to do with the combinability of the process for sorption or extraction by an ion exchange resin in Cupertino et al. with the process of Hyvärinen et al., or with the issue of whether, once combined, Appellant's invention is obtained. Moreover, the acid content of the stripping solution does not teach one of ordinary skill in the art anything about the metal content of the feedstock solution being purified.

Regarding claim 5 of the present invention, Cupertino et al. does not teach that the ion-exchange resin could be used for removing impurities like Zn, Ni, Pb, Fe or Mn from copper electrolyte, but rather only that antimony and bismuth can be removed (col. 4, lines 29-55). It is reasonable for the Office to be required to explain how Cupertino et al. could then teach that these other metal impurities could be removed from a totally different solution. The Office has completely failed to do this.

Regarding claim 8, the Office asserts that Cupertino et al. teaches an aqueous solution with pH value of 2.0 and refers apparently to Example 4, in which the metals are in sulphate form in an aqueous solution and said solution is contacted with an organic solution in a liquid-liquid extraction. However, the pH of the monovalent copper chloride solution is at least 6 according to Appellant's claim 1 and so it is unclear how the Office accounts for this pH disparity.

Regarding claim 9 the Office again refers to the stripping solution of Cupertino et al., which is irrelevant to either Hyvärinen et al. or to the use of an ion exchange resin to remove impurities as described above.



Regarding claim 10 the Office asserts that Hyvärinen et al. teaches the elements this claim. However, claim 10 discloses the elution step of the ion-exchange process, and this cannot be found in Hyvärinen et al. because ion exchange is not used therein. With respect to claim 11, Hyvärinen et al. does not teach that the final purification takes place with ion-exchange resin.

Regarding claim 12, the Office alleges that Cupertino et al. teaches the level of impurities remaining after treatment. However, claim 12 recites that the impurity level of metals is in the range of 0.1 -1 g/l after the hydroxide precipitation and so before ion-exchange resin treatment. Example 4 of Cupertino et al. concerns liquid-liquid extraction of a solution in which metals are in sulphate form. The remainder of the Office's comments relate to the stripping solution, which is irrelevant, for the reasons explained above. The Office's comment that 1 ppm = 1mg/l is also erroneous since 1 mg/l = 1000 ppm.

Claim 15 recites the features of claim 1, and further recites the content of monovalent copper in the aqueous chloride solution that is treated by the ion-exchange treatment. Claim 1 of Cupertino et al. teaches that the acid content of the stripping solution is at least 0.5 M. The Office has again confused the stripping solution of Cupertino et al. with the aqueous solution to be fed to the ion-exchange treatment of the present invention. The acid content of the stripping solution does not provide any teaching about the metal content of the feeding solution. Moreover, claims 1 and 15 of the present invention recites that the pH of the feed solution (i.e., the monovalent copper solution) is at least 6, which means that there is practically no acid in the solution. Moreover, according to claim 15 of the present invention, the copper content can be as high as 100 g/l. This

means that the acid content and copper content have nothing to do with each other in this type of process. The enclosed copies of results of pH calculations for solutions show that if the acid strength of a solution containing hydrochloric acid is 0.5 molar, the pH of the solution is 0.3, which is quite different from a pH of 6. Again, the Office has not explained the pH disparity.

With respect to the Office's "argument 2," i.e., Appellant's arguments concerning the rejection of claims 2-4 and 13 over Hyvärinen et al., Cupertino et al., and Partridge, Appellants note that Partridge is directed to purifying waste effluent from uranium processing. The pH of this solution is 8-12, which is basic, not slightly acidic or neutral as recited in Appellant's claims. The Office asserts that Partridge would be applied to remove certain heavy metals, however, the only metal exemplified is uranium. That the resins used in Partridge remove uranium to sub-ppm levels is not indicative that similar results would be obtainable for any other metals, and the Office has not provided any facts that would show such an equivalence between such uranium-removing resins and other heavy metal removing resins. Moreover, there is no indication in Hyvärinen et al. that any of the metals listed in Partridge are particularly problematic in the process of Hyvärinen et al., since Hyvärinen et al. does not identify the metallic impurities removed therein. Partridge does not cure the deficiencies of Hyvärinen et al. or Cupertino et al., with respect to the failure to disclose or suggest the selective removal of metal impurities while leaving monovalent copper behind.

## CONCLUSION

Appellants submit that the Office's new points of argument raised in the Examiner's Answer do not support its positions regarding the patentability of

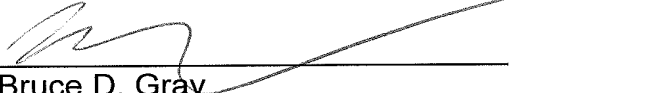
Appellants' claims; to the contrary, these points of argument support Appellants' contentions that the Office's rejections are in error and should be reversed.

Respectfully submitted,

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